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EOCENE PLANTS FROM WYOMING

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So far as I know, the only fossil plants recorded from the Wind River or Bridger are those described in 1930 from the so-called Bridger at Crow Heart Butte, Lenore and Tipperary in Fremont County, Wyoming.¹ These were overwhelmingly indicative of Green River age, and the view was expressed that Green River and Bridger were at least partially equivalent.

Since there was some uncertainty as to the so-called Bridger being really Bridger, although this was the opinion of Granger and Sinclair, it is gratifying to see the sort of floras contained in beds definitely referred to the Bridger and to the Wind River, respectively.

I am indebted to Horace Elmer Wood, 2nd, for a small collection from two localities made during the summers of 1928 and 1931. One of these is very limited and comes from the upper part of the lower Bridger on Little Dry Creek. The second and larger collection is from the Lysite about nine miles west of the town of that name and about six miles west of the type locality of the formation on Bridger Creek. The discovery of this locality is due to Mr. O. J. Schofstell. I am further indebted to Doctor Wood for the following notes on this locality:

"This locality is in the northern part of the Wind River Basin, about nine miles west of Lysite, about six miles west of the type locality of the Lysite Formation on Bridger Creek, and considerably farther from fossiliferous exposures of the Lost Cabin Formation on Alkali Creek to the east, or on Muddy Creek, to the west. The plants occur in a massive, bluish shale, and in the underlying paper shale, exposed for about 150 feet on the north side of the Chicago, Burlington and Quincy Railway cut, at the west end of a prominent hill, estimated to rise 125 feet above the tracks, north of Badwater Creek, in Township 38 North, Range 92 West. The west end of the plant-bearing bed is truncated by erosion, and the east end dips underground. The center of the exposure is about 300 feet west of mile-post 293 of the Chicago, Burlington and Quincy Railway. As the Schoening railroad crossing, indicated on the General Land Office Map of Wyoming, 1923, is less

¹Berry, Edward W., 1930, U. S. Geol. Survey Prof. Paper 165 B.

than a mile distant, it would be appropriate to call this the 'Schoening Locality.' (Schoening is misplaced on the map in question, as it is north, not south of Badwater Creek.) It is possible to reach Schoening by driving nine and a half miles west from Lysite, over a rather sketchy trail, walking the remainder of the distance along the tracks; or, the locality could be reached by hand car, from either Bonneville or Lysite, by arrangement with the railroad.

The plants occur, abundantly, in a paper shale, and, overlying it, in a massive, bluish shale, with an apparent dip of 3° – 8° east, and an actual northeasterly dip. As the specimens in the paper shale, although exceedingly numerous, were equally fragile, we collected largely in the massive shale above. This latter is overlain by a reddish-weathering, massive shale. Higher up are gray clays, with interfingering white sandstone lenses, ranging up to three or four feet thick. Still higher up the

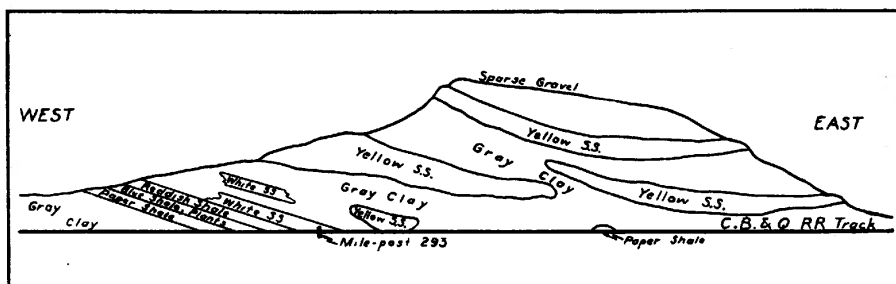


Fig. 1. Diagrammatic view, looking north, of the plant-bearing Lysite, near Schoening.

hill, and to the east, the gray clay contains paper-shale lenses with fragmentary plants, and, also, several thick lenses of cross-bedded yellow sandstone, apparently stream channels, which erode into forms suggestive of the Fox Hills, but which also suggest the sandstone channels in the Lost Cabin Formation on Alkali Creek, seven miles east of the town of Lost Cabin. The top of the hill is covered with a sparse gravel. The only beds visible from the top of the hill are the gray clays, except to the north, where a patch of yellow sandstone appears. This patch, and the hill, are in line with a gap in the Bridger Mountains, not many miles away to the north, and suggest that the sandstones were channel deposits in a stream flowing south from the mountains. The character of the yellow sandstone might suggest that the hill could be an erosion remnant of late Cretaceous rocks buried in Eocene clays. Aside from other considerations, however, this is difficult to reconcile with the fact that the plant bed is both overlain and underlain by gray clays indistin-

guishable from those exposed essentially continuously, between this locality and the type Lysite on Bridger Creek, and that these clays are lithologically similar to the Lysite at the type locality, except for the absence of the red bands, which are well developed on Bridger Creek. These clays, then, can hardly be of other than Lysite age ('Lower Wind River'), except for the possibility of Lost Cabin age (Wind River). The lithology is considerably more suggestive of the Lysite than of the Lost Cabin."

The present collections contain but 11 identifiable species, but obviously a much greater variety would repay careful collecting and it is much to be hoped that these localities will be revisited by someone prepared to make an extensive collection.

The plants identified with their range are shown in the following table:

	Lower Bridger	Lysite	Green River	So-called Bridger of Wind River basin	Puget	Lower Clarno	Claiborne	Jackson
<i>Lygodium kaulfussi</i>	×	×	×	×	×	×	×	
<i>Goniopteris lesquereuxi</i>	×				?	×	?	
<i>Arundo pseudogœpperti</i>		×	×				×	×
<i>Myrica</i> sp.		×	×					
<i>Juglans occidentalis</i>		×	×					
<i>Juglans alkalina</i> (?)		×	×	×				
<i>Quercus castaneopsis</i>		×	×					
<i>Dryophyllum wyomingense</i>		×		×				
<i>Ficus omballi</i>		×	×					
<i>Sapindus obtusifolius</i>		×	×					
<i>Diospyros mira</i>		×		×				

Although the number of species collected is too limited to warrant an extended discussion of either the correlation or ecology, a few remarks are warranted. None of the species is new, although the most abundant form at the Lysite outcrop, *Quercus castaneopsis*, has never before been found except in limited specimens at its type locality in the Green River of Uinta County, and the present material adds considerably to our knowledge of its range in size and form.

Of the 11 species recognized, eight are common to the Green River formation, and of these the following five are not known from any other horizons: *Myrica* sp., *Juglans alkalina*, *Quercus castaneopsis*, *Ficus omballi* and *Sapindus obtusifolius*. Of the remainder, *Dryophyllum wyomingense* and *Diospyros mira* are confined to the present collection and to the so-called Bridger farther south where they are associated with a large number of Green River species.

It is clear that the Lysite and the Green River formations are of the same age as the general stratigraphy and vertebrate palæontology would lead us to infer. It is also clear that the type of flora which comes in with the Green River continues for a long time without much change and is rather sharply contrasted with the flora of the Fort Union and what little we know of the flora of the Wasatch. The present collection also adds some support to my formerly expressed opinion that parts of the time represented by Green River and Bridger overlap. It also reinforces the previous plant evidence that, in terms of world chronology, Wind River and Bridger are slightly younger than the vertebrate fossils indicate.

The only plant in the present collection not known from Green River or so-called Bridger is the fern, *Goniopteris lesquereuxi*, and this is identical with or similar to Middle and Upper Eocene occurrences. There can be little doubt that the present flora is of approximately the same age as the Green River flora, that is, middle Eocene, and Lutetian or Auversian in terms of the European section. The precise floral relations between Green River and Bridger must remain undecided until larger collections are available for study. There are several conspicuous elements in both the Green River and the so-called Bridger which are absent in the present collections, notably the several species of palms, the *Aralias*, *Sparganium*, and *Musophyllum*. Whether these differences are chronological or merely ecological cannot be determined.

As regards environments, the amount of material is so limited that little of value can be stated. Certainly the climate appears to have been warm temperate with a plentiful rainfall. The few species represented

are indicative of a somewhat less humid environment than that shown by the plants from Tipperary, but in such limited material it cannot be certain that this difference is not merely the result of accidents of preservation or discovery.

PTERIDOPHYTA

Family *Schizæaceæ*

Genus *LYGODIUM* Swartz

Lygodium kaulfussi Heer

Lygodium kaulfussi HEER, 1861, Beiträge zur nähern Kenntniss der sächsisch-thüringischen Braunkohle, p. 3, Pl. viii, fig. 21; Pl. ix, fig. 1. LESQUEREUX, 1888, U. S. Nat. Mus. Proc., XI, p. 24. NEWBERRY, 1898, U. S. Geol. Surv. Mon. XXXV, p. 1, Pl. LXII, figs. 1-4. KNOWLTON, 1899, U. S. Geol. Surv. Mon. XXXII, p. 672, Pl. LXXX, figs. 1-3. 1902, U. S. Geol. Surv. Bull. 204, p. 21. 1923, U. S. Geol. Surv. Prof. Paper 131, p. 149, Pl. XXXVI, fig. 7. BERRY, 1926, Geol. Surv. Canada Bull. XLII, p. 95; 1930, U. S. Geol. Surv. Prof. Paper 165, p. 64, Pl. vii, figs. 2, 3.

Lygodium neuropteroides LESQUEREUX, 1871, U. S. Geol. and Geog. Surv. Terr., Ann. Rept. for 1870, p. 384; 1878, The Tertiary Flora, p. 61, Pl. v, figs. 4-7; Pl. vi, fig. 1.

Twining or climbing ferns that bear sterile pinnules proximad and fertile pinnules with much reduced laminæ in terminal panicles. Indusia attached by their broad bases to short oblique veinlets of the greatly reduced laminæ of the fertile pinnules, imbricated and scalelike exactly as in our existing *Lygodium palmatum* Swartz, the only observable difference being the greater reduction of the laminæ in *Lygodium kaulfussi*. Sterile pinnules variable in size and outline; digitately bipartite, tripartite, quadripartite, or quinquepartite; more or less cordate at the base. Lobes are unequal in length and diverge at different angles, are usually obtusely rounded distad, although some of them taper instead of being linear-oblong, and are somewhat widened at the base and separated by deep, angular or narrowly rounded sinuses. The margins are more or less undulate and in some specimens show very broad and very shallow crenations. Texture coriaceous. Venation clearly defined and strong. Two main primaries diverge from the base and give off subbasally a primary for each lobe, and all become lost in the apex of the lobes by repeated branching. The secondaries are close, diverge at narrow angles, and curve outward. They may be several times narrowly forked, a feature that depends on their position and length, and are thin but sharply defined throughout their whole course, terminating in the margins.

The present species has been recorded from a number of European localities¹ and ranges in age from the Lutetian to the Aquitanian. It was first discovered in America at Barrel Springs, Wyoming, in shales that were long thought to be of Green River age but that are not now considered to be a part of that formation. The exact age is unknown but is probably Middle or Upper Eocene. The species, which is present in great abundance, was originally described by Lesquereux as *Lygodium neuropteroides*. Gardner in his discussion of the ferns of the British Eocene says that Lesquereux had material from Bournemouth and stated in a letter that the American form was "positively identical" with the European, and Newberry came to the same conclusion.² Fructifications are associated with these sterile pinnules at several localities. The American material is identical with the European in the character of the fertile pinnules and in the venation of the sterile pinnules. The sterile pinnules are in general broader and more obtuse in the American material. The species is exceedingly abundant in the Eocene of Wyoming. It has also been recorded from the Eocene of the Pacific coast and from the Fort Union of Wyoming, and I fail to find specific differences between these specimens and those from the Claiborne. The species has been found abundantly in the Claiborne, in the so-called Bridger of the Wind River Basin in Wyoming, in the Green River of Colorado and Wyoming, and in the Puget group of Washington and British Columbia.

In the present collections it is represented by considerable material, including both sterile and fertile pinnules from near Lysite and a single specimen of a sterile pinnule from near the top of the lower Bridger at the head of Little Dry Creek.

The genus *Lygodium* has between 20 and 30 existing species in the warmer parts of both hemispheres and extends outside the subtropical zone into the warmer temperate regions in southern Japan (*Lygodium japonicum* Swartz), in northern New Zealand (*Lygodium articulatum* Richard), and in eastern North America, where *Lygodium palmatum* Swartz ranges as far northward as the southern New England States. All the modern forms are lianas, either climbing or twining, and some of the tropical species are said to exceed a hundred feet in length. The Tertiary forms probably shared this habit.

¹Except for the type reference, only American citations are given in the foregoing synonymy.

²Newberry, J. S., 1898, The latter extinct floras of North America: U. S. Geol. Survey Mon. XXXV, p. 3.

Family **Polypodiaceæ**Genus **GONIOPTERIS** Presl**Goniopteris lesquereuxi** Berry, new species

Lastrea fischeri LESQUEREUX, 1883 (not Heer, 1855), Cret. and Tert. Flora, p. 239, Pl. I, figs. 1, 1a. NEWBERRY, 1898, U. S. Geol. Surv. Mon. XXXV, p. 10, Pl. XLVIII, fig. 6. KNOWLTON, 1902, U. S. Geol. Surv. Bull. 204, p. 22. 1914, Bull. 590, p. 36. ?PENHALLOW, 1902, Roy. Soc. Canada Trans., 2d Ser., VIII, see IV, p. 48. ?PENHALLOW, 1908, Can. Geol. Surv., Rept. Tert. Plants Brit. Columbia, p. 61.

The geographical remoteness and the great difference in geological age makes it certain that this form from the western United States is not the same botanical species as Heer's type from the Miocene of Switzerland.

It is also easy to point out certain minor differences in shape and venation between the European and American specimens sufficient to justify their recognition as distinct species, but it is a well-known fact to students of recent ferns, although it has not been sufficiently realized by students of fossil ferns, that there can be a great deal of variation in such features within the limits of a single species, so that I rely more on the separation of the two in space and time.

Had it not been for the large amount of material which I have studied of the Claiborne species *Goniopteris claiborniana* Berry¹ and the South American Pliocene species *Goniopteris cochabambensis* Berry², from Bolivia and Ecuador, both of which are highly variable, I am sure I would not have fully realized this fact. If these two species and what Lesquereux, Newberry and Knowlton identified as *Lastrea fischeri* Heer³ occurred in the same section or same basin of deposition, I would refer them, without a moment's hesitation, to a single botanical species. All fall within the same limits of variation in form and degree of incision of the pinnae and have the same winged stipes.

Goniopteris lesquereuxi is very similar to the more common form of *Goniopteris claiborniana*. It has all the free laterals simple in the limited amount of material which I have seen, but in one fragment from the head of Little Dry Creek, the proximal laterals may send a branch to the adjacent one next above.

There are three specimens in the present collection, most of which are not especially well preserved and evidently considerably macerated before burial, since there is a mass of winged stipes of various sizes and

¹Berry, E. W., 1917, Torrey Bot. Club Bull., XLIV, p. 331, Pl. xxii. 1924, U. S. Geol. Survey Prof. Paper 92, p. 44, Pls. iv, v.

²1922, Johns Hopkins University Studies in Geology, No. 4, p. 159, Pls. i, ii. Idem, 1929, No. 10, p. 95, Pl. ii, figs. 7-9.

³Heer, O., 1855, Flora Tert. Helvetiæ, I, p. 34, Pl. ix, fig. 3.

many fragments of pinnæ, and the other plant remains associated with this species, including *Lygodium*, are also much broken.

Without having seen all the American material which has been referred to *Lastrea fischeri*, it is not possible to make a conclusive statement of distribution.

The material from Currant Creek, Oregon, described by Newberry and referred to by Knowlton, appears to be identical with the present Bridger material, as does also that described by Lesquereux from the John Day Valley in Oregon. These outcrops are referred to the lower Clarno horizon. Penhallow recorded this species from the Paskapoo formation of Red Deer River in Alberta and from the Eocene of Burrard Inlet, British Columbia. Both of these records I regard as highly doubtful, not only because Penhallow's systematic work was notoriously unreliable, but also because he himself points out differences in the case of the Paskapoo material, which was also very limited.

The Burrard Inlet locality belongs to the Puget group which also contains the associated *Lygodium kaulfussii* Heer, and therefore Penhallow's determination may be correct in this case.

A rather full account of the systematic status of the genus *Goniopteris* and of its constituent fossil species was given¹ in 1924, to which the reader is referred.

The present material comes from near the top of the lower Bridger near the head of Little Dry Creek.

SPERMOPHYTA

MONOCOTYLEDONÆ

Order **POALES**

Family **Poaceæ**

Genus **ARUNDO** of authors

Arundo pseudogæpperti Berry

Arundo gæpperti LESQUEREUX, 1871, Ann. Rept. U. S. Geol. Surv. Terr., Suppl., p. 5. 1878 (not Munster or Heer), Tertiary Flora, p. 86, Pl. VIII, figs. 3-5.

Arundo pseudogæpperti BERRY, 1914, U. S. Geol. Surv. Prof. Paper 84, p. 134, Pl. XXIV, fig. 7. 1924, U. S. Geol. Surv. Prof. Paper 92, pp. 49, 148, Pl. XLI, fig. 6.

This species is represented near Lysite, and at the other localities from which it has been recorded by fragments of striated stems and parallel-veined leaves, which are rather indefinite as to both specific and generic features. Hence the term *Arundo* is used in a generalized sense and cannot be considered as indicating a close relationship with

¹Berry, E. W., 1924, U. S. Geol. Survey Prof. Paper 92, pp. 44-46.

existing species of *Arundo*. It was described originally from the Green River and is not uncommon in the Claiborne and Jackson of the south-eastern United States

DICOTYLEDONÆ

Order MYRICALES

Family Myricaceæ

Genus MYRICA De Candolle

Myrica sp. Knowlton

Myrica sp. KNOWLTON, 1923, U. S. Geol. Surv. Prof. Paper 131, pp. 157, 158, Pl. XXXVII, fig. 2; Pl. XL, fig. 13.

Knowlton described two fragmentary specimens from the Green River beds of Colorado as representing two undeterminable species of *Myrica* and pointed out their resemblance to what Lesquereux called *Myrica nigricans*, which last Knowlton referred to the genus *Rhus*, and the writer referred to the genus *Cupanites*. There is this resemblance but there are specific differences.

Although Knowlton's small *Myrica* sp. is not exactly like his larger *Myrica* sp., I believe they belong to a single botanical species, which is probably new but insufficiently represented to be properly characterized. In the present collections from the Lysite there is one small specimen and counterparts of a larger specimen which are the same as Knowlton's Colorado material. These are also too incomplete to be properly described.

Order JUGLANDALES

Family Juglandaceæ

Genus JUGLANS Linné

Juglans occidentalis Newberry

Juglans occidentalis NEWBERRY, 1883, U. S. Nat. Mus. Proc., V, p. 507. 1898, U. S. Geol. Surv. Mon. XXXV, p. 34, Pl. LXV, fig. 1; Pl. LXVI, figs. 2-4. KNOWLTON, 1923, U. S. Geol. Surv. Prof. Paper 131, p. 158. BERRY, 1930, U. S. Geol. Surv. Prof. Paper 156, p. 58, Pl. IX, fig. 4.

This quondam species, which was for a long time confused with *Juglans schimperi* Lesquereux, was described in the first instance from Green River, Wyoming. It occurs also in the Wilcox Eocene and perhaps elsewhere, although this is very uncertain. There is a rather full discussion in Knowlton's paper cited above, which I have followed, although it is highly probable that the two names represent the variants of a single botanical species, in which case the name *schimperi* has priority.

The species is sparingly represented in the recent collection from the Lysite.

***Juglans alkalina* Lesquereux (?)**

Juglans alkalina LESQUEREUX, 1878, The Tertiary Flora, p. 288, Pl. LXII, figs. 6-9. KNOWLTON, 1923, U. S. Geol. Surv. Prof. Paper 131, p. 160. BERRY, 1930, U. S. Geol. Surv. Prof. Paper 165, p. 68, Pl. x, figs. 1, 2.

This species was heretofore known from only the Green River and the supposed Bridger of the Wind River basin.

There is a considerable number of incomplete specimens, for the most part larger than the type, in the present collections from the Lysite, which I refer to this species with some hesitation. They are referable to the genus *Juglans* with some certainty, and are very similar to this species. They are certainly not distinctive enough to warrant their reference to a new species.

Order **FAGALES**

Family **Fagaceæ**

Genus **QUERCUS** Linné

***Quercus castaneopsis* Lesquereux**

Quercus castaneopsis LESQUEREUX, 1883, Cret. and Tert. Flora, p. 155, Pl. XXVIII, fig. 10.

This species was described by Lesquereux from the Green River beds of Uinta County, Wyoming, and has not heretofore been discovered at any other outcrops. It is the most abundant species in the Lysite at the locality near Lysite, but all of my material is broken. The leaves are of all sizes, but have a characteristic and readily recognizable aspect despite their relative proportions and considerable variability in marginal dentition. The accompanying figure is a composite of proximal medial and distal specimens of a rather large leaf. Some specimens indicate slightly larger leaves than the figure, and from this they range downward to leaves not more than 6 centimeters in length and 1.75 centimeters in maximum width.

The species may be redescribed as follows:

Leaves of variable size, lanceolate in outline, widest below the middle, with an extended acuminate tip and a cuneate base. Margins entire at the base, elsewhere with short, somewhat variably spaced, teeth which range in shape from dentate to serrate; in places these are one to a secondary but they are frequently more numerous. Texture coriaceous. Petiole stout, its length undetermined. Midvein stout and rather prominent. Secondaries stout, numerous and rather closely

spaced, diverging from the midvein at wide angles frequently approaching 90° , subparallel, at first straight but curving regularly and prominently upward in the marginal region, camptodrome; they approach close to the marginal teeth but do not enter them, this being done by tiny oblique tertiaries. There are subsecondaries between many of the secondaries which are lost by branching toward the margins or which may continue to camptodrome endings like the true secondaries. Tertiaries form a series of open inosculating veins at approximately right angles to the secondaries. The areolation consists of very minute but usually prominent polygonal meshes.

Genus **DRYOPHYLLUM** Debey

Dryophyllum wyomingense Berry

Dryophyllum wyomingense BERRY, 1930, U. S. Geol. Surv. Prof. Paper 165, p. 69, Pl. x, figs. 3-5.

This species, which comes from the supposed Bridger at Tipperary in the Wind River basin of Wyoming, has been described, as far as the available material will permit, in a recent paper to which the reader is referred. It is sparingly represented in the present collection from the Lysite.

Order **URTICALES**

Family **Moraceæ**

Genus **FICUS** Linné

Ficus omballi Brown

Ficus omballi BROWN, 1929, U. S. Geol. Surv. Prof. Paper 154, p. 285, Pl. LXXII, fig. 2.

This species was described by Brown from the Green River beds at a locality 30 miles northwest of De Beque, Colorado. In many respects it resembles some of the leaves (not the type) from Green River, Wyoming, which Lesquereux referred to *Ficus ungeri*,¹ as well as some of those from the Wind River basin of

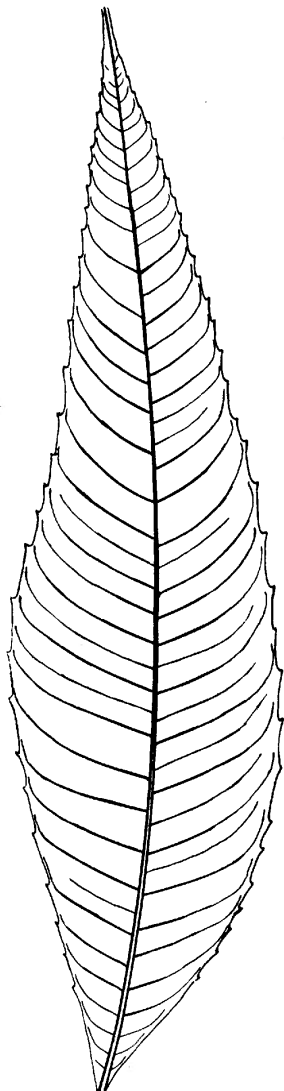


Fig. 2. A large leaf of *Inercus castaneopsis* Lesquereux. Two-thirds natural size.

¹Lesquereux, L., 1883, Cret. and Tert. Flora, p. 163, Pl. XLIV, fig. 2.

Wyoming which I referred to that species,¹ and it may be that there is some confusion, although this does not apply to the large wide leaves that have been referred to the latter species.

There are counterparts of the basal part of a relatively small leaf in the present collection from the Lysite which agree with Brown's species in form and venation but in which the basal part of the lamina is slightly more extended than his figured specimen. The petiole is preserved and is stout, about a centimeter in length, and expanded at the base.

Order **SAPINDALES**

Family **Sapindaceæ**

Genus **SAPINDUS** Linné

Sapindus obtusifolius Lesquereux

Sapindus obtusifolius LESQUEREUX, 1874, U. S. Geol. and Geog. Surv. Terr., Ann. Rept. 1873, p. 419. 1878 (not Lesquereux, 1885), Tertiary Flora, p. 266, Pl. XLIX, figs. 8-11. KNOWLTON, 1923 (not Knowlton, 1902), U. S. Geol. Surv. Prof. Paper 131, p. 166.

The type of this species came from eight miles southeast of Green River, Wyoming. It has been recorded by Lesquereux from Florissant, Colorado, and from the Fort Union of Dakota, and by Knowlton from the Mascall beds of Oregon. These are all almost certainly erroneous and were to all intents and purposes repudiated by Knowlton in his last discussion of the Green River flora (1923).

The present species is not very precisely delimited, although it is clear from one of the type specimens, which shows 10 subopposite leaflets attached to the stipe, that we have to do with a leaf of pinnate habit.

The Lysite material is a single leaflet and its counterpart. The species is otherwise confined to the Green River and has been found in both Wyoming and Colorado.

Order **EBENALES**

Family **Ebenaceæ**

Genus **DIOSPYROS** Linné

Diospyros mira Berry

Diospyros mira BERRY, 1930, U. S. Geol. Surv. Prof. Paper 165, p. 76, Pl. XIII, fig. 4; Pl. XIV, fig. 7.

This species was described from the so-called Bridger of the Wind River basin at Tipperary, Fremont County, Wyoming. The type

¹Berry, E. W., 1930, U. S. Geol. Survey Prof. Paper 165, p. 70.

material was rather scanty and was identified as *Diospyros*, on the basis of its resemblance to other Eocene species in that genus and to the leaves of the existing *Diospyros virginiana* Linné. As there were some unnoticed typographical mistakes in the published description, and as the present material is somewhat larger, the species may be recharacterized as follows: Leaves of medium to large size, ovate, widest midway between the apex and the base, tapering equally and uniformly distad and proximad to the equally and shortly acute apex and base. Margins entire, evenly rounded. Leaf substance not thick but stiff and subcoriaceous. Length ranging from 8 to 14 centimeters. Maximum width 4.25 to 6 centimeters. Petiole stout, its length unknown, midvein stout, prominent, curved or slightly flexuous. Secondaries stout, 6 to 8 alternate pairs, fairly equally spaced, diverging from the midvein at angles of about 45°, curving regularly upward, and camptodrome in 2 or 3 diminishing arches. Tertiaries mostly obsolete, alike in the so-called Bridger and Lysite material.

The genus is an old and large one, ranging from the Upper Cretaceous to the present, and with many existing species, most of which are tropical although there are several exceptions in both hemispheres, our common eastern American *Diospyros virginiana* reaching northward as far as southern New England, and there is a well-marked late Miocene species, in Washington, represented by both leaves and fruit calices.

